

Accuracy of GPS Determined Topex/Poseidon Orbits During Anti-Spoof Periods

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BIOGRAPHIES

Ronald Muellerschoen received a B.S. degree in physics at Rensselaer Polytechnic Institute and a M.S. degree in applied math at the University of Southern California. He is currently a Member of the Technical Staff in the Earth Orbiter Systems Group at the Jet Propulsion Laboratory (JPL). His work at JPL has concentrated on the development of efficient filtering/smoothing software for processing GPS data and the processing of Topex/Poseidon-GPS data.

Willy Bertiger received his Ph.D. in Mathematics from the University of California, Berkeley, in 1976, specializing in Partial Differential Equations. Following his Ph.D., he continued research in maximum principles for systems of partial differential equations while teaching at Texas A&M University. In 1981, he went to work for Chevron Oil Field Research. At Chevron, he worked on numerical models of oilfields and optimization of those models for Super Computers. In 1985, he began work at JPL as a Member of the Technical Staff in the Earth Orbiter Systems Group. His work at JPL has been focused on the use of GPS for high precision orbit determination.

Sien Wu received his B.S.E.E. degree from the National Taiwan University, Taipei, Taiwan; and Ph.D. degree from the University of Waterloo, Ontario, Canada. He joined the Jet Propulsion Laboratory in 1975 and is currently a Technical Group Leader in the Tracking Systems and Applications Section. He has been involved with the development of various tracking systems for deep-space as well as near-earth space vehicles, and their applications to precision geodesy. His current interest is in the precision applications of the NAVSTAR Global Positioning System.

Timothy Munson is a Member of the Technical Staff at Jet Propulsion Laboratory.

James Zumberge received his Ph.D. in physics from the California Institute of Technology in 1981. He worked on industrial applications of nuclear physics at MDI Industries in Monrovia, CA, before joining JPL's Satellite Geodesy and Geodynamics Systems Group in 1990.

Bruce Haines received his Ph.D. in Aerospace Engineering Sciences from the University of Colorado in 1991, after which he joined the Earth Orbiter Systems Group at JPL. He is a member of the Topex/Poseidon Joint Verification and Precision Orbit Determination Teams, and specializes in precise orbit and geodetic analyses using GPS and in oceanographic applications of satellite altimetry.

ABSTRACT

The Topex/Poseidon satellite carries a high precision GPS Demonstration Receiver (GPSDR). When the GPS anti-spoof function is off, the GPSDR uses L1-code to obtain GPS pseudorange and carrier phase observables at L1 and L2 frequencies. These observables can be combined to yield ionosphere-free pseudorange and phase measurements. During anti-spoof periods, the GPSDR tracks only the L1 C/A signal. Obtaining data at one frequency prohibits the computation of ionosphere-free measurements. Combining the GPSDR flight measurements with ionosphere-free corrected data acquired simultaneously from a global ground network of Rogue and TurboRogue receivers and solving for stochastic clocks eliminates the effects of selective availability, as well as satellite and ground receiver clock errors.